AP Statistics Practice Test (page 137)

T2.1 e. The percentile tells what percent of scores are below that value.

T2.2 d. At one standard deviation away from the mean (–1 and 5), the curve has its inflection point. Also, approximately 95% of the values are between –4 and 8.

T2.3 b. Both the addition and the multiplication affect the mean, but only the multiplication affects the standard deviation.

T2.4 b. About 20% consume fewer than 4 ounces and about 60% consume fewer than 8 ounces, so about 40% consume between 4 and 8 ounces.

T2.5 a. Solve the following equation for σ: $1.04 = \frac{60-55}{\sigma}$. The value 1.04 is the approximate 85th percentile of the standard Normal distribution as found in Table A.

T2.6 e. The total area under any density curve is 1.

T2.7 c. Two feet constitutes 24 inches. Since there is a spread of about 6 standard deviations in a length that encompasses 99.7% of all observations, we would estimate the standard deviation to be $\frac{24}{6} = 4$ inches.

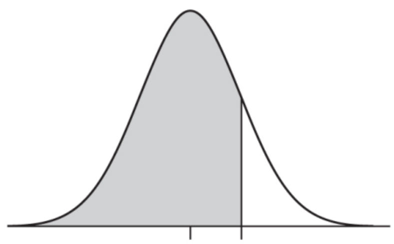
T2.8 e. The proportion of observations with $z > -3.0$ in a Standard Normal distribution is 0.9987.

T2.9 e. $z = \frac{540-470}{110} = 0.27$.

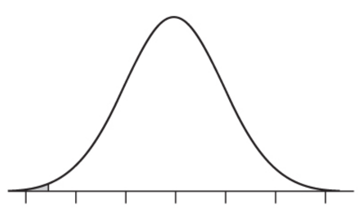
T2.10 c. Gina's z-score is $z = \frac{540-470}{110} = 0.27$. Colleen's z-score is $z = \frac{530-515}{116} = 0.13$.

T2.11 (a) Jane's performance was better. Because her performance (40) exceeded the standard for the Presidential award (39), she performed above the 85th percentile (better than at least 85% of 9 year old females). Matt's performance (40) met the standard for the National award (40), meaning he performed at the 50th percentile (better than 50% of 12 year old boys).
(b) Since Jane's score has a higher percentile than Matt's score, she is farther to the right in her distribution than Matt is in his. Therefore, Jane's standardized score will likely be greater than Matt's.

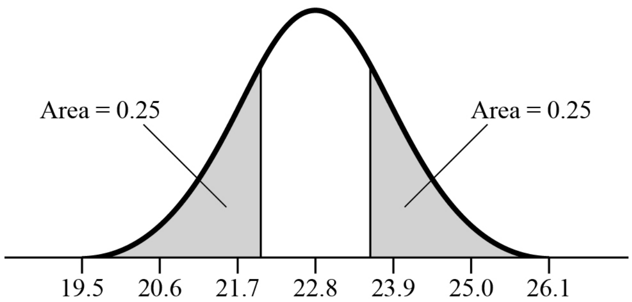
T2.12 (a) **Step 1: State the distribution and values of interest.** For male soldiers, head circumference follows a Normal distribution with mean 22.8 inches and standard deviation 1.1 inches. We want to find the percent of soldiers with head circumference less than 23.9 inches (see graph below). **Step 2: Perform calculations. Show your work.** The standardized score for the boundary value is $z = \frac{23.9-22.8}{1.1} = 1$. From Table A, the proportion of z-scores below 1 is 0.8413. *Using technology:* The command normalcdf(lower: –1000, upper: 23.9, μ: 22.8, σ: 1.1) gives an area of 0.8413. **Step 3: Answer the question.** About 84% of soldiers have head circumferences less than 23.9 inches. Thus, 23.9 inches is at the 84th percentile.



(b) **Step 1: State the distribution and values of interest.** For male soldiers, head circumference follows a Normal distribution with mean 22.8 inches and standard deviation 1.1 inches. We want to find the percent of soldiers with head circumferences less than 20 inches or greater than 26 inches (see graph below). **Step 2: Perform calculations. Show your work.** The standardized score for the boundary values are $z = \frac{20 - 22.8}{1.1} = -2.55$ and $z = \frac{26 - 22.8}{1.1} = 2.91$. From Table A, the proportion of z-scores below $z = -2.55$ is 0.0054 and the proportion of z-scores above 2.91 is $1 - 0.9982 = 0.0018$, for a total of $0.0054 + 0.0018 = 0.0072$. *Using technology:* The command 1 – normalcdf(lower: 20, upper: 26, μ: 22.8, σ: 1.1) gives an area of $1 - 0.9927 = 0.0073$. **Step 3: Answer the question.** A little less than 1% of soldiers have head circumferences less than 20 inches or greater than 26 inches and require custom helmets.



(c) **Step 1: State the distribution and values of interest.** For male soldiers, head circumference follows a Normal distribution with mean 22.8 inches and standard deviation 1.1 inches. The first quartile is the boundary value with 25% of the area to its left. The third quartile is the boundary value with 75% of the area to its left (see graph below). **Step 2: Perform calculations. Show your work.** Look in the body of Table A for the value closest to 0.25. A z-score of –0.67 gives the closest value (0.2514). Solving $-0.67 = \frac{x - 22.8}{1.1}$ gives $Q_1 = 22.063$. Now, look in the body of Table A for the value closest to 0.75. A z-score of 0.67 gives the closest value (0.7486). Solving $0.67 = \frac{x - 22.8}{1.1}$ gives $Q_3 = 23.537$. *Using technology:* The command invNorm(area: 0.25, μ: 22.8, σ: 1.1) gives $Q_1 = 22.058$. The command invNorm(area: 0.75, μ: 22.8, σ: 1.1) gives $Q_3 = 23.542$. Thus, $IQR = 23.542 - 22.058 = 1.484$. **Step 3: Answer the question.** The IQR is 1.484 inches.



T2.13 No, these data do not seem to follow a Normal distribution. First, there is a large difference between the mean and the median. In a Normal distribution the mean and median are the same, but in this distribution the mean is 48.25 and the median is 37.80. Second, the distance between the minimum and the median is $37.80-2=35.80$, but the distance between the median and the maximum is $204.90-37.80=167.10$. In a Normal distribution, these distances should be about the same. Because the mean is larger than the median and the distance from the median to the maximum is larger than the distance from the minimum to the median, these data appear to be skewed to the right.